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Enhancement of the CP-odd effect in the nuclear electric dipole moment of ^{6}Li

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We calculate for the first time the electric dipole moment (EDM) of the ^{6}Li nucleus within the $\alpha + p + n$ three-body cluster model using the Gaussian expansion method, assuming the one-meson exchange P, CP-odd nuclear forces. It is found that the EDM of ^{6}Li is 2 times more sensitive to the isovector pion exchange P, CP-odd nuclear force than the deuteron EDM because of the CP-odd interaction between the nucleons and the α cluster. The ^{9}Be EDM is also calculated in the same framework as an $\alpha + \alpha + n$ three-body system. We also test the *ab initio* calculation of the EDM of the deuteron, ^{3}H, and ^{3}He nuclei using the realistic Argonne $v18$ nuclear force. In the *ab initio* calculations, good agreements with previous studies are obtained. We finally discuss the prospects for new physics beyond the standard model.

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I. INTRODUCTION

It is commonly believed that the current baryon number asymmetry was created at the early stage of our universe. It is, however, known that the standard model of particle physics has difficulties realizing this scenario, therefore making new source(s) of charge parity (CP) violation beyond the standard model (BSM) necessary. One promising experimental probe to search for CP violation is the *electric dipole moment* (EDM) [1–9]. The EDM has many advantages, such as accurate measurability in experiments with lower cost than in accelerator experiments, very small standard model contribution [10], etc. It was so far measured in various systems, such as the neutron [11], atoms [12], molecules [13], and the muon [14].

Among the systems in which the EDM can be measured, the nucleus is of particular interest [9,15], as the measurement of the EDM of light nuclei using storage rings is currently being planned at Brookhaven National Laboratory, with prospective sensitivity of $O(10^{-29})e$ cm [16]. The nuclear EDM also has its own advantages. First, it does not suffer from Schiff's screening [17], because there are no electrons to screen the nuclear polarization. In addition, the nuclear system may enhance the nucleon level CP violation owing to many-body effects [18]. These arguments make the nuclear EDM a very attractive probe for the strong sector CP violation. For these reasons, theoretical investigations of the EDMs of the deuteron [19–24] and three-nucleon systems [25–29] have been pursued extensively.

As the next object of study, the EDM of the ^{6}Li nucleus appears to be a natural choice, because it is the lightest stable system with nonzero angular momentum following the three-nucleon systems. The ^{6}Li nucleus is known to have a cluster structure [30], so we may expect some enhancement of the nucleon level CP violation, because of the derivative interaction of the CP-odd Hamiltonian. In this sense, the analysis of the ^{6}Li EDM is also interesting from the point of view of nuclear structure and cluster dynamics [31].

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In this work, we therefore investigate the EDM of the ^{6}Li nucleus in the cluster approximation, as an $\alpha - p - n$ three-body system. We also calculate the EDM of the ^{9}Be nucleus as an $\alpha - \alpha - n$ system [32–35]. Furthermore, the *ab initio* calculations are tested on the deuteron, the ^{3}He, and ^{3}H nuclei using the Argonne $v18$ interaction [36]. To solve the many-body Schrödinger equation, we use the Gaussian expansion method [37], which was applied to a wide number of subjects, extending from particle to atomic physics [38–41], and is also expected to give accurate results in the study of the EDM of few-nucleon systems.

This paper is organized as follows. We first give the definition of the EDM and then briefly review our calculational method. Next, the result of the EDM of the ^{6}Li nucleus is given, together with the EDMs of ^{9}Be, ^{3}He, ^{3}H, and ^{2}H nuclei. The paper is concluded by discussing the prospects for the determination of new physics BSM and summarizing our results.

II. THE NUCLEAR ELECTRIC DIPOLE MOMENT

To induce the nuclear EDM, P, and CP-odd nucleon level processes are required. The nuclear EDM has two leading sources: (1) the intrinsic EDM of the constituent nucleons, and (2) the P, CP-odd $N - N$ interactions (nuclear force) which polarize the whole nucleus. In this work, we neglect the exchange current, because its contribution is expected to be small [20].

Let us first consider the contribution of the intrinsic EDM of the constituent nucleons to the nuclear EDM. As the nucleon EDM is proportional to the nucleon spin, the effect can simply be given by

$$\begin{aligned} d_A^{(\mathrm{Nedm})} &= \sum_i^A d_i \langle A|\sigma_{iz}|A\rangle \\ &\equiv \langle \sigma_p \rangle_A \, d_p + \langle \sigma_n \rangle_A \, d_n, \end{aligned} \tag{1}$$

where $|A\rangle$ is the polarized nuclear wave function ($A = {}^2$H, ^{3}He, ^{3}H, ^{6}Li, ^{9}Be). Here d_p and d_n are the proton and neutron EDMs, respectively. These are given parameters which depend

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on QCD and elementary level physics. The coefficients $\langle\sigma_p\rangle_A$ and $\langle\sigma_n\rangle_A$ are the spin matrix elements of the nucleus, and depend only on the nuclear structure. The contribution of the single nucleon EDM may be enhanced if the nucleon behaves relativistically inside the nucleus, as it is the case for atomic systems [3,4,42]. As the nucleons are nonrelativistic in light nuclei, the linear coefficients of the systems in question will not receive any sizable enhancement.

The effect of the nuclear polarization generated by the *CP*-odd nuclear force may, in contrast, be enhanced even in light nuclear systems. The polarization contribution of the *P*, *CP*-odd nuclear force to the nuclear EDM is given by

$$d_A^{(\mathrm{pol})} = \sum_{i=1}^{A} \frac{e}{2} \langle \tilde{A} | \big(1+\tau_i^z\big) \mathcal{R}_{iz} | \tilde{A} \rangle, \tag{2}$$

where $|\tilde{A}\rangle$ is the polarized (with respect to the z axis) nuclear wave function, and τ_i^z is the isospin Pauli matrix. $\mathcal{R}_{iz}$ is (the z component of) the position of the constituent nucleons in the nuclear center-of-mass frame. This permanent polarization effect is realized through the mixing of opposite parity states.

Below, we discuss the details of the *CP*-odd nuclear force, necessary to generate the above-mentioned polarization. In this study, the *CP*-odd nuclear force is given by the standard one, based on one-meson exchange potential [20,43]. The respective Hamiltonian is given by

$$\begin{aligned} H_{PT} = \frac{1}{2m_N} \Big\{ & \boldsymbol{\sigma}_- \cdot \nabla \big(\bar{G}_\eta^{(0)} \mathcal{Y}_\eta(r) - \bar{G}_\omega^{(0)} \mathcal{Y}_\omega(r) \big) \\ & + \boldsymbol{\tau}_1 \cdot \boldsymbol{\tau}_2 \, \boldsymbol{\sigma}_- \cdot \nabla \big[\bar{G}_\pi^{(0)} \mathcal{Y}_\pi(r) - \bar{G}_\rho^{(0)} \mathcal{Y}_\rho(r) \big] \\ & + \frac{1}{2} \tau_+^z \, \boldsymbol{\sigma}_- \cdot \nabla \big[\bar{G}_\pi^{(1)} \mathcal{Y}_\pi(r) - \bar{G}_\eta^{(1)} \mathcal{Y}_\eta(r) \\ & - \bar{G}_\rho^{(1)} \mathcal{Y}_\rho(r) - \bar{G}_\omega^{(1)} \mathcal{Y}_\omega(r) \big] \\ & + \frac{1}{2} \tau_-^z \, \boldsymbol{\sigma}_+ \cdot \nabla \big[\bar{G}_\pi^{(1)} \mathcal{Y}_\pi(r) + \bar{G}_\eta^{(1)} \mathcal{Y}_\eta(r) \\ & + \bar{G}_\rho^{(1)} \mathcal{Y}_\rho(r) - \bar{G}_\omega^{(1)} \mathcal{Y}_\omega(r) \big] \\ & + \big(3\tau_1^z \tau_2^z - \boldsymbol{\tau}_1 \cdot \boldsymbol{\tau}_2 \big) \boldsymbol{\sigma}_- \cdot \nabla \big[\bar{G}_\pi^{(2)} \mathcal{Y}_\pi(r) \\ & - \bar{G}_\rho^{(2)} \mathcal{Y}_\rho(r) \big] \Big\}, \end{aligned} \tag{3}$$

where $\bar{G}_X^{(i)} \equiv g_{XNN} \bar{g}_{XNN}^{(i)}$ is the coupling constant of the *CP*-odd nuclear force with the exchanged mesons $X = \pi,\eta,\rho,\omega$. The index $i = 0,1,2$ denotes the isoscalar, isovector, and isotensor structures. The Yukawa function is given by $\mathcal{Y}_X(r) = \frac{e^{-m_X r}}{4\pi r}$. As the *CP*-odd effect is small, the polarization contribution to the nuclear EDM can be given by the linear term,

$$d_A^{(\mathrm{pol})} = \sum_{X,i} a_{A,X}^{(i)} \bar{G}_X^{(i)}. \tag{4}$$

The linear coefficients $a_{A,X}^{(i)}$ depend only on the nuclear structure, and are the main targets of the present work.

III. METHODOLOGY AND MODEL SETUP

We study the structure of the ^{6}Li and ^{9}Be nuclei within the framework of the $\alpha + n + p$ and $\alpha + \alpha + n$ three-body cluster models. Here, we assume the α cluster to be an inert core and adopt three types of Jacobian coordinates (for example, see Fig. 3 of Ref. [44] in the case of ^{6}Li). Regarding the calculation of three-nucleon systems such as the ^{3}H and ^{3}He nuclei, we employ the Jacobian coordinates shown in Fig. 1 of Ref. [37].

The Schrödinger equation is given by

$$(H - E)\, \Psi_{JM,TT_z}(^{3,6,9}\mathrm{Z}) = 0, \tag{5}$$

with

$$H = T + \sum_{\mathrm{a,b}} V_{\mathrm{ab}} + V_{\mathrm{Pauli}}, \tag{6}$$

where T is the kinetic energy operator, and V_{ab} the interaction between constituent particles a and b [including the *CP*-odd Hamiltonian of Eq. (3)]. The orthogonality condition model (OCM) projection operator V_{Pauli} is given below for ^{6}Li and ^{9}Be. The total wave functions for ^{6}Li and the three-nucleon systems are described in Eq. (3.2) of Ref. [44] and Eq. (66) of Ref. [37], respectively. The wave function of the ^{9}Be nucleus can be given as

$$\begin{aligned} \Psi_{JM,TT_z}(^9\mathrm{Be}) = \sum_{c=1}^{2} \sum_{nl,NL} \sum_{IK} \sum_{sS} C_{nl,NL}^{(c)} \, \mathcal{S}_\alpha \big[\big[\Phi(\alpha_1)\Phi(\alpha_2) \\ \times \big[\phi_{nl}^{(c)}(\mathbf{r}_c) \psi_{NL}^{(c)}(\mathbf{R}_c) \big]_\Lambda \, \chi_{\frac{1}{2}}(N_1) \big] \big]_J. \end{aligned} \tag{7}$$

Here the operator $\mathcal{S}_\alpha$ stands for the symmetrization between the two α clusters. The spin function of the nucleon is denoted by $\chi_{\frac{1}{2}}$.

Following the Gaussian expansion method [37,38,41,45], we take the functional forms of $\phi_{nlm}(\mathbf{r})$, $\psi_{NLM}(\mathbf{R})$ as

$$\begin{aligned} \phi_{nlm}(\mathbf{r}) &= r^l \, e^{-(r/r_n)^2} Y_{lm}(\widehat{\mathbf{r}}), \\ \psi_{NLM}(\mathbf{R}) &= R^L \, e^{-(R/R_N)^2} Y_{LM}(\widehat{\mathbf{R}}), \end{aligned} \tag{8}$$

where the Gaussian range parameters were chosen according to the following geometric progression:

$$\begin{aligned} r_n &= r_1 a^{n-1} \quad (n = 1 - n_{\max}), \\ R_N &= R_1 A^{N-1} \quad (N = 1 - N_{\max}). \end{aligned} \tag{9}$$

The angular momentum space $l,L,\Lambda \leqslant 2$ was found to be sufficient to obtain good convergence of the calculated results.

The Pauli principle in the $N - \alpha$ and $\alpha - \alpha$ systems is taken into account in the OCM [46]. The OCM projection operator V_{Pauli} can be written down as

$$V_{\mathrm{Pauli}} = \lim_{\lambda \to \infty} \sum_f \lambda \, |\phi_f(\mathrm{r}_{\alpha x})\rangle \langle \phi_f(\mathrm{r'}_{\alpha x})|, \tag{10}$$

which rules out the amplitude of the Pauli-forbidden $\alpha - \alpha$ and $\alpha - N$ relative states $\phi_f(\mathrm{r}_{\alpha x})$ from the three-body total wave function [47]. The forbidden states are $f = 0s,1s,0d$ for $x = \alpha$, and $f = 0s$ for $x = N$, respectively. The Gaussian range parameter b of the single-particle $0s$ orbit in the α cluster $(0s)^4$ is taken to be $b = 1.358$ fm to reproduce the size of the α cluster. We employ the $\alpha - N$ and $\alpha - \alpha$ interactions so

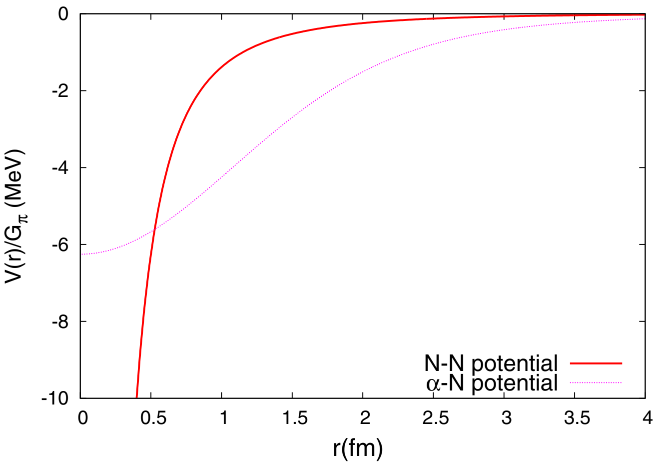

FIG. 1. (Color online) The folded CP-odd one pion exchange $\alpha - N$ potential, in comparison with the CP-odd $N - N$ interaction potential. The coupling constant $\bar{G}_\pi^{(1)}$ was factored out for both cases.

as to reproduce the scattering phase shift of the $\alpha - N$ and $\alpha - \alpha$ systems at low energy [30,48]. Furthermore, we use the Argonne $v18$ nuclear force for the three-nucleon systems, and the Argonne $v8'$ interaction for the N-N subsystem of the ^{6}Li nucleus [36].

Some comments on the structure of the ^{9}Be nucleus are in order here. In Ref. [35], ^{9}Be was investigated with a fully antisymmetrized wave function which fulfills the Pauli principle, and successfully reproduces its low lying energy levels. In our calculation, we have considered the effect of antisymmetrization via the OCM, which takes into account the Pauli principle approximately. The low lying opposite parity state $(3/2^+)$ was found in our calculation at 4 MeV, which is qualitatively in good agreement with the experimental data of 4.7 MeV. ^{9}Be is therefore qualitatively well described in the cluster approximation within OCM, within the accuracy required for our discussion.

For the CP-odd nuclear force, we have used the following folding procedure:

$$V_{\alpha-N}(\mathbf{r}) = \int d^3\mathbf{r}'\, V_{PT}(\mathbf{r}-\mathbf{r}')\rho_\alpha(\mathbf{r}'), \qquad (11)$$

where V_{PT} is the radial function of the CP-odd nuclear force and $\rho_\alpha(r) = \frac{4}{b^3\pi^{3/2}} e^{-r^2/b^2}$ is the nucleon number density of the α cluster normalized to 4. The nucleon number density was approximated by a single Gaussian with the spread of $b = 1.358$ fm. The effect of the the above folding operation is illustrated in Fig. 1. It is important to note that the folding cancels the CP-odd nuclear forces for which the spin or isospin Pauli matrix acts on both interacting nucleons simultaneously. Therefore, only the isovector pion exchange, isoscalar η exchange, isoscalar, and isovector ω exchange CP-odd nuclear forces survive for the $\alpha - N$ system. For the $\alpha - \alpha$ system, all CP-odd nuclear forces cancel.

It should furthermore be kept in mind that the folding may overestimate the effect of heavy meson exchange η,ρ,ω, because the α cluster approximation partially averages the microscopic level physics. At the microscopic level, the nuclear force has a repulsive core which hinders the contribution of the short-range CP-odd potential by a heavy meson exchange. This effect may break away when the folding averages the potential at the α cluster scale. We will return again to this issue later in the analysis of the ^{6}Li and ^{9}Be EDMs.

IV. RESULTS AND DISCUSSION

We now proceed to the EDM result of the ^{6}Li nucleus in the cluster approximation, which is shown in Table I. For the isovector CP-odd one-pion exchange contribution, we have found that the ^{6}Li EDM enhances the CP violation by a factor of 2 compared with that of the deuteron. As already mentioned earlier, the ^{6}Li EDM is composed of the deuteron cluster polarization and the effect of the CP-odd $\alpha - N$ interaction. The contribution from the deuteron subsystem to the ^{6}Li EDM takes a value close to the single deuteron EDM (about 43% of the total ^{6}Li EDM). This can also be seen by inspecting the ^{6}Li EDM induced by the isovector exchange of ρ and η mesons, which has no contribution to the CP-odd $\alpha - N$ potential. The CP-odd $\alpha - N$ contribution to the ^{6}Li EDM takes a value comparable to the contribution from the deuteron cluster. This fact is quite natural because the polarization from the CP-odd nuclear force on each subsystem of ^{6}Li should be of the same order.

The polarization of the $\alpha - N$ subsystem is a new effect which is not relevant for the deuteron, ^{3}He, and ^{3}H EDMs. The enhancement of the CP-odd effect in the ^{6}Li nucleus can be explained by this new contribution which interferes constructively with the EDM of the deuteron subsystem. It can straightforwardly be shown from the calculation of the spin and isospin matrix elements that the contributions from the $\alpha - p$ and $\alpha - n$ subsystems in the same way interfere constructively in ^{6}Li. In our calculation, the $\alpha - N$ and $N - N$ relative distances were found to be 4 fm and 3.5 fm, respectively. This

TABLE I. Results of the EDM calculations of this work. The linear coefficients of the CP-odd $N - N$ coupling $a_X^{(i)}$ $(X = \pi,\rho,\eta,\omega,$ $i = 0,1,2)$ are expressed in units of $10^{-2}e$ fm. The symbol – denotes that the result vanishes in our setup.

	$\langle\sigma_p\rangle$	$\langle\sigma_n\rangle$	$a_\pi^{(0)}$	$a_\pi^{(1)}$	$a_\pi^{(2)}$	$a_\rho^{(0)}$	$a_\rho^{(1)}$	$a_\rho^{(2)}$	$a_\eta^{(0)}$	$a_\eta^{(1)}$	$a_\omega^{(0)}$	$a_\omega^{(1)}$
^{2}H	0.914	0.914	–	1.45	–	–	6.25×10^{-2}	–	–	0.157	–	-5.90×10^{-2}
^{3}He	−0.04	0.89	0.59	1.08	1.68	-3.02×10^{-2}	4.26×10^{-2}	-7.68×10^{-2}	-5.77×10^{-2}	0.106	2.27×10^{-2}	-5.27×10^{-2}
^{3}H	0.88	−0.05	−0.59	1.08	−1.70	3.07×10^{-2}	4.27×10^{-2}	7.86×10^{-2}	5.80×10^{-2}	0.106	-2.28×10^{-2}	-5.34×10^{-2}
^{6}Li	0.88	0.88	–	2.8	–	–	7.1×10^{-2}	–	–	0.16	–	−0.41
^{9}Be	–	0.45	–	1.4	–	–	–	–	−0.49	–	0.35	−0.35

result supports the cluster representation of the ^{6}Li nucleus. The cluster picture is known to well describe ^{6}Li [30,49], so it should also be well described in the model we have adopted.

For the ω meson exchange *CP*-odd potential, the enhancement of the *CP*-odd effect in ^{6}Li is more accentuated. This may, however, be an overestimation, as the short-range part was averaged from our folding procedure. The calculated contributions of the isovector *CP*-odd ρ and η exchange potential are reliable because their effects arise only from the deuteron cluster. We must also note that the isoscalar and isotensor *CP*-odd potentials do not contribute to the ^{6}Li EDM, because of the inert α cluster and the isospin symmetry. These *CP*-odd interactions are relevant if we consider the isospin breaking effect together with the excitation of the α cluster because then the spin and isospin structures become active [26]. These topics are the subject of a more microscopic level study, and need to be investigated in future works.

We also give the result of the calculation of the ^{9}Be EDM in the cluster approximation. It is shown in Table I. The sensitivity of the ^{9}Be EDM to the isovector *CP*-odd pion exchange nuclear force is comparable to that of the deuteron. Interestingly, the effect of the polarization from the *CP*-odd $\alpha - N$ interaction is close to that for the ^{6}Li EDM. From our calculation, the distance between the α cluster and the neutron is about 4 fm in ^{9}Be. This result is quite close to the $\alpha - N$ distance in ^{6}Li, and explains why their $\alpha - N$ contributions are of the same order.

For heavier meson (η,ρ,ω) exchange processes, the sensitivity of ^{9}Be on the *CP*-odd potential is much more important, but this is again likely to be an overestimation because all those effects arise from the dangerous folding of the heavy meson exchange *CP*-odd nuclear force. As for ^{6}Li, there are also *CP*-odd interactions which may contribute with the excitation of the α cluster. A more careful inspection of them are therefore needed at a more microscopic level.

We have moreover tested the *ab initio* calculation of the EDMs of the deuteron, ^{3}He and ^{3}H using the Argonne $v18$ interaction [36] and the *CP*-odd Hamiltonian of Eq. (3). The corresponding results are shown in Table I. For the deuteron, the result is in good agreement with those of Refs. [20,27]. We wish to emphasize that the coefficients of the intrinsic nucleon EDM contribution $\langle \sigma_{p,n} \rangle_{^2\mathrm{H}}$ are smaller than one. In the literature, these values were often set to one, but this is only true if the deuteron total angular momentum does not receive any orbital angular momentum contributions. As the deuteron is known to have a *d*-wave component, the coefficients should be corrected accordingly.

Let us now present the result for the ^{3}He and ^{3}H nuclear EDM. In our framework, the binding energies of the ^{3}He and ^{3}H nuclei obtained with the Argonne $v18$ nuclear force are 6.93 and 7.63 MeV, respectively. The discrepancy between our findings and the experimental values (7.7 MeV for ^{3}He and 8.4 MeV for ^{3}H) can be explained by the lack of the three-body force contribution [50]. For the EDMs of the ^{3}He and ^{3}H, we have found values which are in agreement with the recent study using chiral effective field theory [28,29]. It agrees with Ref. [27] for the *CP*-odd isoscalar and isovector nuclear forces. Our result, however, differs from that of Ref. [25] by a factor of 1/2 for all *CP*-odd nuclear force contributions.

Let us as a last point discuss the prospects for the observation of new physics BSM. If we model the new physics contribution by the exchange of a new particle with mass M_{NP} in the virtual state with an $O(1)$ CP phase, dimensional analysis gives the typical *CP*-odd $N - N$ coupling as $\bar{G}_\pi \sim g_{\mathrm{NP}}^2 \frac{\Lambda_{\mathrm{QCD}}^2}{M_{\mathrm{NP}}^2}$, where $\Lambda_{\mathrm{QCD}} \sim 200$ MeV, and g_{NP} is the coupling between quarks and the new particle. If the EDM of the ^{6}Li nuclei can be measured at the level of $O(10^{-29})e$ cm, we thus can probe a new physics scale of $M_{\mathrm{NP}} \sim 10$ TeV [with $g_{\mathrm{NP}} = O(0.1)$ and an additional loop factor of $O(10^{-2})$]. This naïve estimation works for models which generate isovector *CP*-odd four-quark interactions, such as the left-right symmetric model [51].

For the supersymmetric model, the sensitivity of $O(10^{-29})e$ cm for the ^{6}Li EDM can probe the CP phases of the μ term θ_μ and the trilinear supersymmetry breaking coupling θ_A at the level of $O(10^{-2})$ for the supersymmetry breaking scale $M_{\mathrm{SUSY}} \sim$ TeV [5]. Here we have assumed the Peccei-Quinn symmetry [52], and $\tan\beta = O(1)$. The sensitivity to θ_μ may be increased with growing $\tan\beta$ [5,53]. This prospective sensitivity could thus unveil the CP violation in the high scale supersymmetry breaking scenario.

Here, let us also give an estimate of the sensitivity to the class of models which generate Barr-Zee-type diagrams. This is the case for the Higgs doublet models [54], supersymmetric models with *R*-parity violation [8,55], which contribute through the chromo-EDM [56]. Using the simple formula of the quark chromo-EDM $d_q^c \sim \frac{m_Q Y_q Y_Q}{16\pi^2 m_{NP}^2} \ln \frac{m_Q^2}{m_{NP}^2}$, where m_Q is the inner loop quark mass, and Y_q and Y_Q are the couplings between the exchanged scalar and the quarks q and Q, respectively, we obtain a sensitivity on scales of new physics of the order of $M_{\mathrm{NP}} \sim \sqrt{Y_q Y_Q}$ PeV. If the coupling constants Y_q and Y_Q are small, the sensitivity to the scale BSM is attenuated.

V. SUMMARY

In this paper we have calculated the EDM of ^{2}H, ^{3}He, ^{3}H, ^{6}Li, and ^{9}Be nuclei using the Gaussian expansion method. We have found that ^{6}Li enhances the *CP*-odd effect, because of the effect of the *CP*-odd $\alpha - N$ interaction, in addition to the polarization contribution from the deuteron subsystem. With the experimental sensitivity of $O(10^{-29})e$ cm for the ^{6}Li EDM, it is possible to unveil the CP violation BSM up to the TeV scale. We therefore strongly recommend the experimentalists to study and measure the EDM of ^{6}Li.

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